We claim:

1. A method of fabricating a variable resistance device comprising:

preparing a silicon substrate;

forming a silicon oxide layer on the substrate;

depositing a first metal layer on the silicon oxide, wherein the metal of the first metal layer is taken from the group of metals consisting of platinum and iridium;

depositing a perovskite metal oxide thin film on the first metal layer;

depositing a second metal layer on the perovskite metal oxide, wherein the metal of the second metal layer is taken from the group of metals consisting of platinum and iridium;

annealing the structure at a temperature of between about 400°C to 700°C for between about five minutes and three hours; and

completing the variable resistance device.

2. The method of claim 1 wherein said depositing a perovskite metal oxide thin film includes depositing multiple layers of a perovskite metal oxide to a thickness of between about 100 nm to 300 nm, baking the structure between deposition of each layer at a temperature of between about 100°C to 250°C in an ambient atmosphere and annealing the structure at a temperature of between about 400°C to 700°C in an oxygen atmosphere for between about five minutes and twenty minutes.

3. The method of claim 2 which includes progressively stepping the temperature up from about 100°C to about 250°C, including initially heating the structure to about 120°C for one minute, then heating the structure to about 180°C for about one minute, and then heating the structure to about 240°C for about one minute.

4. The method of claim 1 wherein said depositing a perovskite metal oxide thin film includes depositing a thin film which has a general formula of $M'_xM''_{(1-x)}M_yO_z$, wherein:

M': is taken from the group consisting of La, Ce, Bi, Pr, Nd, Pm, Sm Y, Sc, Yb, Lu, Gd;

M": is taken from the group consisting of Mg, Ca, Sr, Ba, Pb, Zn, Cd;

M: is taken from the group consisting of Mn, Ce, V, Fe, Co, Nb, Ta, Cr, Mo, W, Zr, Hf, Ni;

x: has a range of between 0 to 1;

y: has a range of between 0 to 2; and

z: has a range of between 1 to 7.

5. The method of claim 1 which further includes changing the resistance of the completed device by varying the length of resistance-change-producing pulse.

6. The method of claim 5 wherein said changing the resistance of the completed device includes decreasing the resistance of the device by applying a voltage of between about one to three volts between the first metal layer and the second metal layer for a period of greater than 700 nsec.

7. The method of claim 5 wherein said changing the resistance if the completed device includes increasing the resistance of the device by applying a voltage of between about two to five volts between the first metal layer and the second metal layer for a period of less than 1000 nsec.

8. The method of claim 1 wherein said depositing a first metal layer on the silicon oxide, and wherein said depositing a second metal layer on the perovskite metal oxide, includes depositing layers which have a thickness of between about 100 nm and 200nm.

9. The method of claim 1 wherein said depositing a perovskite metal oxide thin film includes depositing a layer of amorphous perovskite metal oxide thin film.

10. A method of fabricating a variable resistance R-RAM device comprising:

preparing a silicon substrate having a silicon oxide layer on the surface thereof;

depositing a first metal layer on the silicon oxide, wherein the metal of the first metal layer is taken from the group of metals consisting of platinum and iridium;

depositing a perovskite metal oxide thin film on the first metal layer, including depositing multiple layers of a perovskite metal oxide to a thickness of between about 100 nm to 300 nm, and baking the structure between deposition of each layer at a temperature of between about 100°C to 250°C in an ambient atmosphere and annealing the structure at a temperature of between about 400°C to 700°C in an oxygen atmsphere for between about five minutes and twenty minutes;

depositing a second metal layer on the perovskite metal oxide, wherein the metal of the second metal layer is taken from the group of metals consisting of platinum and iridium;

annealing the structure at a temperature of between about 400°C to 700°C for between about five minutes and three hours in an oxygen atmosphere; and

completing the variable resistance device.

11. The method of claim 10 which includes progressively stepping the temperature up from about 100°C to about 250°C, including initially heating the structure to about 120°C for one minute, then heating the structure to about 180°C for about one minute, and then heating the structure to about 240°C for about one minute.

12. The method of claim 10 wherein said depositing a perovskite metal oxide thin film includes depositing a thin film which has a general formula of $M'_xM''_{(1-x)}M_yO_z$, wherein:

M': is taken from the group consisting of La, Ce, Bi, Pr, Nd, Pm, Sm Y, Sc, Yb, Lu, Gd;

M": is taken from the group consisting of Mg, Ca, Sr, Ba, Pb, Zn, Cd;

M: is taken from the group consisting of Mn, Ce, V, Fe, Co, Nb, Ta, Cr, Mo, W, Zr, Hf, Ni;

x: has a range of between 0 to 1;

y: has a range of between 0 to 2; and

z: has a range of between 1 to 7.

13. The method of claim 10 which further includes changing the resistance of the completed R-RAM device by varying the length of resistance-change-producing pulse.

14. The method of claim 13 wherein said changing the resistance of the completed device includes decreasing the resistance of the device by applying a voltage of between about one to three volts between the first metal layer and the second metal layer for a period of greater than 700 nsec.

15. The method of claim 13 wherein said changing the resistance if the completed device includes increasing the resistance of the device by applying a voltage of between about two to five volts between the first metal layer and the second metal layer for a period of less than 1000 nsec.

16. The method of claim 10 wherein said depositing a first metal layer on the oxide, and wherein said depositing a second metal layer on the perovskite metal oxide, includes depositing layers have a thickness of between about 100 nm and 200 nm.

17. The method of claim 10 wherein said depositing a perovskite metal oxide thin film includes depositing a layer of amorphous perovskite metal oxide thin film, and wherein said baking changes a portion of the amorphous perovskite metal oxide thin film into a crystalline layer.

18. A method of fabricating a variable resistance R-RAM device comprising:

preparing a silicon substrate having a silicon oxide layer on the surface thereof;

depositing a first metal layer on the silicon oxide, wherein the metal of the first metal layer is taken from the group of metals consisting of platinum and iridium;

depositing a perovskite metal oxide thin film on the first metal layer, including depositing multiple layers of a perovskite metal oxide to a thickness of between about 100 nm to 300 nm, and baking the structure between deposition of each layer at a temperature of between about 100°C to 250°C in an ambient atmosphere, which includes progressively stepping the temperature up from about 100°C to about 250°C, including initially heating the structure to about 120°C for one minute, then heating the structure to about 180°C for about one minute, and then heating the structure to about 240°C for about one minute, and annealing the structure at a temperature of between about 400°C to 700°C in an oxygen atmsphere, wherein the baking and annealing last for between about five minutes and twenty minutes;

wherein said depositing a perovskite metal oxide thin film includes depositing a layer of amorphous perovskite metal oxide thin film, and wherein said baking changes a portion of the amorphous perovskite metal oxide thin film into a crystalline layer;

depositing a second metal layer on the perovskite metal oxide, wherein the metal of the second metal layer is taken from the group of metals consisting of platinum and iridium;

annealing the structure at a temperature of between about 400°C to 700°C for between about five minutes and three hours in an oxygen atmosphere; and

completing the variable resistance device.

19. The method of claim 18 wherein said depositing a perovskite metal oxide thin film includes depositing a thin film which has a general formula of $M'_xM''_{(1-x)}M_yO_z$, wherein:

M': is taken from the group consisting of La, Ce, Bi, Pr, Nd, Pm, Sm Y, Sc, Yb, Lu, Gd;

M": is taken from the group consisting of Mg, Ca, Sr, Ba, Pb, Zn, Cd;

M: is taken from the group consisting of Mn, Ce, V, Fe, Co, Nb, Ta, Cr, Mo, W, Zr, Hf, Ni;

x: has a range of between 0 to 1;

y: has a range of between 0 to 2; and

z: has a range of between 1 to 7.

20. The method of claim 18 which further includes changing the resistance of the completed R-RAM device by varying the length of resistance-change-producing pulse.

21. The method of claim 20 wherein said changing the resistance of the completed device includes decreasing the resistance of the device by applying a voltage of between about one to three volts between the first metal layer and the second metal layer for a period of greater than 700 nsec, and wherein said changing the resistance if the completed device includes increasing the resistance of the device by applying a voltage of between about two to five volts between the first metal layer and the second metal layer for a period of less than 1000 nsec.

22. The method of claim 18 wherein said depositing a first metal layer on the oxide, and wherein said depositing a second metal layer on the perovskite metal oxide, includes depositing layers have a thickness of between about 100 nm and 200 nm.

10072225.020702

23. A variable resistance R-RAM device comprising:

a silicon substrate having a silicon oxide layer thereon;

a first metal layer formed on the silicon oxide layer, wherein the metal of the first metal layer is taken from the group of metals consisting of platinum and iridium;

a perovskite metal oxide thin film layer formed on the first metal layer;

a second metal layer formed on the perovskite metal oxide, wherein the metal of the second metal layer is taken from the group of metals consisting of platinum and iridium; and

metallizing elements to provide a complete device.

24. The device of claim 23 wherein said a perovskite metal oxide thin film has a general formula of $M'_xM''_{(1-x)}M_yO_z$, wherein:

M': is taken from the group consisting of La, Ce, Bi, Pr, Nd, Pm, Sm Y, Sc, Yb, Lu, Gd;

M": is taken from the group consisting of Mg, Ca, Sr, Ba, Pb, Zn, Cd;

M: is taken from the group consisting of Mn, Ce, V, Fe, Co, Nb, Ta, Cr, Mo, W, Zr, Hf, Ni;

x: has a range of between 0 to 1;

y: has a range of between 0 to 2; and

z: has a range of between 1 to 7.

25. The device of claim 23 wherein the resistance of the R-RAM device is changed by changing by varying the length of resistance-change-producing pulse applied between the first metal layer and the second metal layer.

26. The device of claim 25 wherein the resistance of the R-RAM device is decreased by applying a voltage of between about one to three volts between the first metal layer and the second metal layer for a period of greater than 700 nsec.

27. The device of claim 25 wherein the resistance of the R-RAM device is increased by applying a voltage of about two to five volts between the first metal layer and the second metal layer for a period of less than 1000 nsec.

28. The device of claim 23 wherein said first metal layer and said second metal layer have a thickness of between about 100 nm and 200 nm.

29. The device of claim 23 wherein said perovskite metal oxide thin film includes a layer of amorphous perovskite metal oxide thin film.